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Real-Time Atomization Of Agricultural Environment For Social Modernization Of Indian Agricultural System

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Abstract
In the years since its independence, India has made immense progress towards food security. Indian population has tripled, but food-grain production more than quadrupled: there has been substantial increase in available food-grain per capita.The project is designed to provide medium and long-term credit to farmers for the purchase of farm machinery and for the development of small private irrigation system. For the precisely monitoring and controlling of the agriculture filed, different types of sensors were used. To implement the proposed system ARM LPC2148 Microprocessor is used. The irrigation mechanism is monitored and controlled more efficiently by the proposed system, which is a real time feedback control system.GSM technology is used to inform the end user about the exact field condition. Actually this method of irrigation system has been proposed primarily to save resources, yield of crops and farm profitability.

Keywords-ARM LPC 2148 Microprocessor, GSM, sensors: Temperature, Humidity, Soil moisture, Phase sensor.

I. Introduction

In many agricultural cropping systems irrigation [1,2] is necessary. In semiarid and arid areas, efficient water applications and management are of major concerns. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Large amount of water goes waste due to improper planning of water usage. The demand for new water saving techniques in irrigation is increasing rapidly right now. The aim of farmer in agriculture [3] is to produce "more crop per drop", hence there is need to find the irrigation techniques which consumes less fresh water. These techniques are helpful in the regions where there is a scarcity of fresh water. In the modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drop by drop due to which a large quantity of water is saved.

At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land from time to time.

This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be hazardous to plants before wilting becomes visible. This problem can be perfectly solved if automatic controller based drip irrigation system is used in which irrigation will take place only when there is intense requirement of water. Irrigation system uses valves to turn ON or OFF automatically.

Automatic Drip Irrigation [4] is a valuable tool for accurate soil moisture control in highly specialized greenhouse production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits. Along with water the other important resources to the crop are the nutrients. If the nutrients are available in the right amount for the growth of crops then the yield of the crops also increases. Thus the productivity can be raised with the proper management of water resources and nutrients.

II. Irrigation

There have been technological advancements in agriculture sector from the last decades and growth of the irrigated areas. But the traditional irrigation methods are still predominant when it comes to try and correct the natural rain distribution. The artificial application of water to the soil for growing crops is called as irrigation. Irrigation is mainly used in dry areas and in periods of rainfall shortfalls to increase crop production. The detail analysis of the conditions must be done while providing irrigation to the land.

- Types of irrigation

1. Surface Irrigation (conventional irrigation)
2. Sprinkler Irrigation
3. Drip Irrigation

The conventional methods of irrigation like sprinklers of overhead type, flood type irrigation systems wets the lower leaves and stem of the plants. When irrigation is done by using such methods the soil surface is often saturated and stays wet for long time after irrigation is completed. These conditions leads to infections by leaf mould fungi. The flood type methods consume large

amount of water and the intermediate area between crop rows remains dry and receives water only from incidental rainfall. In order to solve this problem the drip or trickle irrigation[8,11] is used which is a type of modern irrigation technique that slowly applies small amounts of water to part of plant root zone

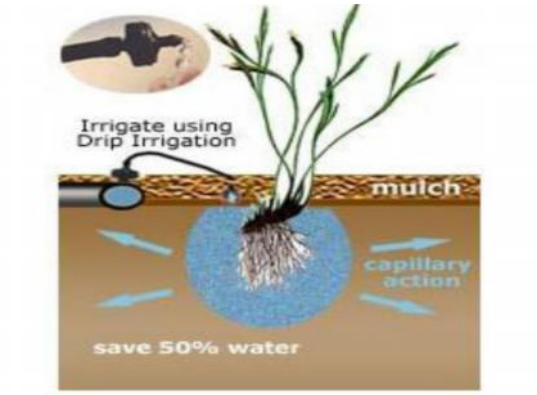

Fig. 1.Drip Irrigation at Root Zone

Drip irrigation at plant's root zone is shown in Fig.1. Its shape depends on soil characteristics. Drip irrigation [5] system saves water because only the plant's root zone receives moisture and helps to conserve water resources. Small amount of water is lost through deep percolation if the proper amount is applied.

III. System Architecture

Automation of the irrigation system is gaining importance as there is need to use water resources efficiently and also to increase the field productivity. The system is used to turn the valves ON or OFF automatically as per the water requirement of the plants. The system is used for sensing, monitoring, controlling and for communication purpose. The system block diagram is shown in Fig. 2.Different sensors are used to detect the different parameters of the soil like moisture, temperature, humidity and nitrogen content of the soil. Depending upon the sensors output the ARM7 processor [9, 10] will take the necessary action. The moisture [8,12] sensor output will help to determine whether to irrigate the land or not depending upon the moisture content. Along with Moisture sensor the temperature sensor output can also be taken into consideration while irrigating the land. If the moisture content of soil is very low and the temperature is very high then there is need of irrigation for plants, but the time for which irrigation will be provided is different for different temperature range. Because if the temperature is very high then the evaporation rate is also very high and hence we have to provide water for more time in order to attain the proper moisture level in the soil. Hence for different temperature range and moisture content level in the soil the land will be irrigated for different time interval.

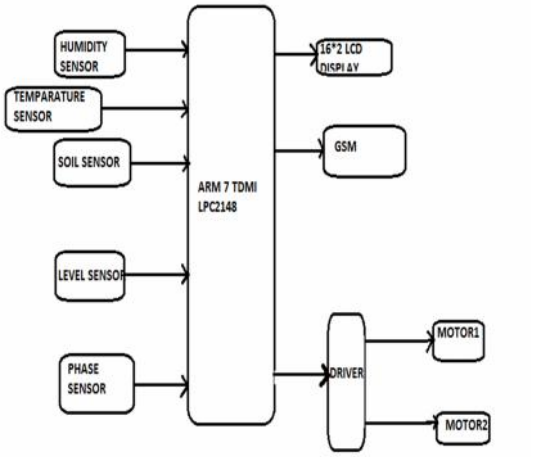

Fig2: Block Diagram of Real–Time Irrigation System

In the system the nitrogen content of the soil is also detected. According to the available nitrogen content in the soil suggestions can be given to the farmer to add the fertilizers containing nitrogen for healthy plant growth. In the system LCD display is used to display various measured parameter of the soil and also the required suggestions. Solenoid valves are used in the system, which are controlled through the relay bank. The data is transmitted wirelessly by using Si4432 ISM transceiver and the data is fetched by using PC and which will be used for analysing purpose. The keypad is used to choose the soil type in which the system will work and accordingly we can set the threshold points. Keypad is also used for manual operation. Thus the system will help to monitor, control and communicate.

IV.Operation Of Real-Time Atomation Of Indian Agricultural System

Before going to the operation of the circuit, first we have to give the necessary power supply to all the components. The designed components need 5v supply to work whereas the arm processors need 3.3v supply. So we are giving 3.3v from the LM317. This is the device can provide 3.3v to the processor. For remaining devices will get supply from our power supply circuit will give 5v output. MCU-based home wireless control centre is used along with one WSN centre node module and several data collecting nodes, GSM module, GSM network and mobile phone. The WSN data collecting [7] node modules are connected with different types of sensors. When the components are activated, all the components will read and gives the output signal to the controller, when the

user want to get the information then user should have to send a message from his mobile and immediately corresponding readings will send short message to the users through the GSM module and GSM network immediately. Here we use only GSM for prototype development. The sensor readings are analog in nature so the ADC pin in the controller will convert the analog signals into digital format. Then the controller will access information. The operation of the circuit is given as, when we want access our field information then we have send a message to GSM modem[6], that modem consists of SIM (Subscriber Identity Module) and another will be user mobile. When user want to access the field information, then user should send message to the GSM. Then the particular sensor will activate and reads the present condition of the field and gives the same information to the user number. User can analyze the results, if the results are seems to be very bad, then user should provide necessary fertilizers or any other precautions they have to follow.

V. Software

KEIL µ VISION (IDE)

Keil an ARM company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251 and 8051 MCU families.

When starting a new project simply select the microcontroller you use from the Device Database and the µVision IDE sets all compiler, assembler, linker, and memory options. The Keil ARM tool kit includes three main tools, assembler, compiler and linker. An assembler is used to assemble the ARM assembly program. A compiler is used to compile the C source code into an object file. A linker is used to create an absolute object module suitable for in-circuit emulator.

Here visual basic software is used on the PC. The data send by the system is fetched by PC which is used for analysis purpose. The algorithm to view the data is given below.

Algorithm:

1. Start
2. Open the main form.
3. Select com port of PC.
4. Open wireless data communication.
5. Capture the wireless data.
6. Store the data in database.
7. Show the respective data to user for analysis.
8. End.

VI.Conclusion

Real – Time Irrigation Control System for Precision Agriculture using WSN in Indian Agricultural Sectors has been proposed to bring Indian agricultural system to the world class standards. Irrigation in agricultural areas has a crucial importance. With the increasing demand for water resources, optimal usage of water resources has been provided with greater extent by automation technology. The proposed system is a real time feedback control system which monitors and controls the irrigation system activities efficiently. The results will be displayed on the both LCD panel and user mobile, for testing the output instantly. GSM is responsible for controlling the irrigation on field and sends them to the receiver. The information is send to the user on request in the form of SMS.

VI.Future Enhancements

By developing a Smart Wireless Sensor and by using upcoming techniques a farmer can increase his profit by solving different problems that are faced by the farmer in his routine life. And also to involve ARM – Controller with a video capturing by using an MMS facility about the crop position and at the same time sending video to the farmer.

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